

Paris Session 2022



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For power system expertise

Biomimicry and energy, a systemic eco-design approach to address the challenges of the energy and ecological transition

PS 1 Setting ambitious climate targets in the energy sector

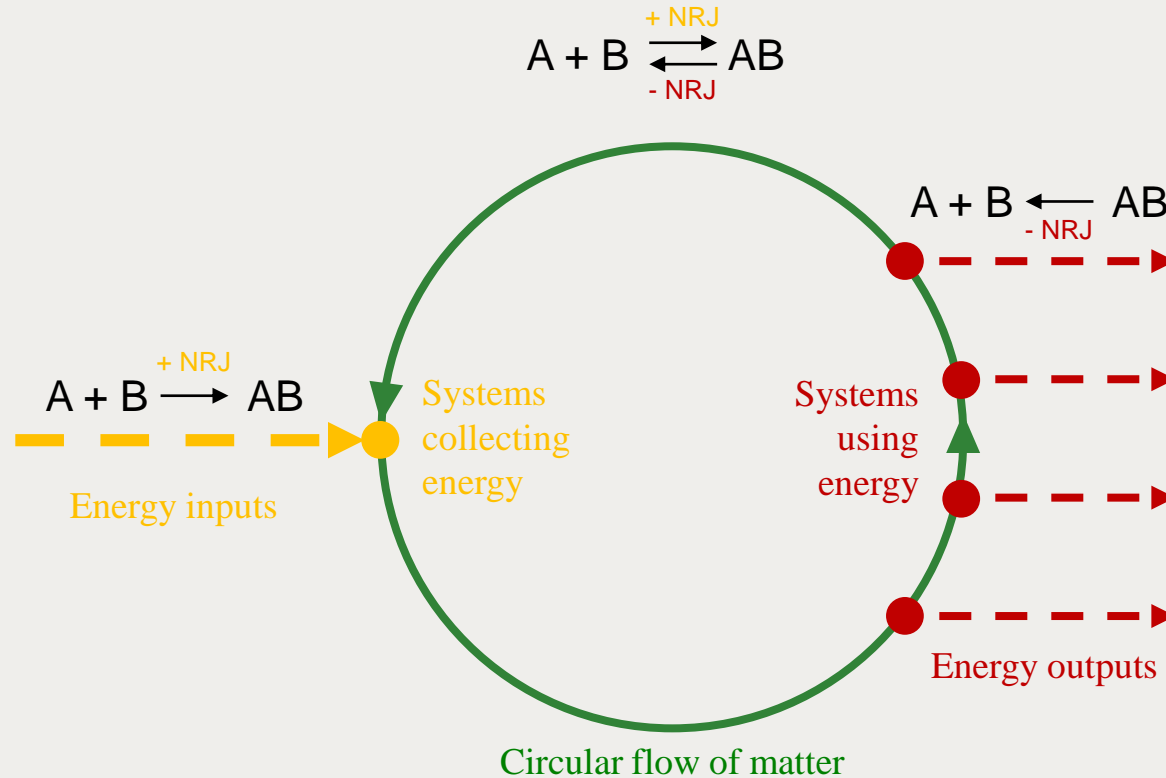
Question 1.10. Among the numerous examples of energy-related industrial processes and/or technologies mentioned in the paper (Tables 1 – 4), can the authors highlight the most promising ones? Is it possible to give ideas of the current R&D efforts on these most promising issues)?

Dr. Kalina Raskin, France

Biomimicry and energy, the key challenges

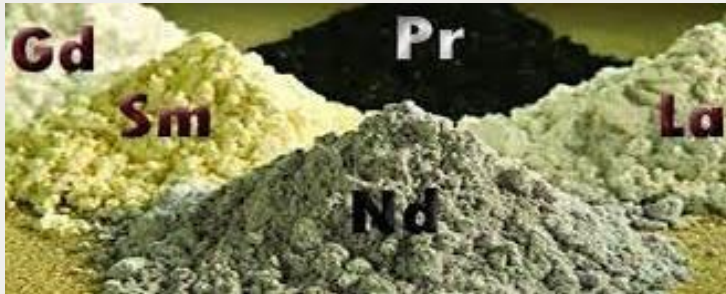
How to combine the sustainability of both energy and matter, circular reasoning ? A, B and AB are molecules :

Locally stock energy collected from flow of vectors, how to become primary producers without using rare materials ?

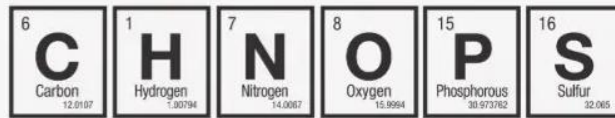


Optimize energy use, how to prevent energy use for little to no benefits (= energy loss) how to reduce each system's energy consumption ?

Examples of currently researched axes



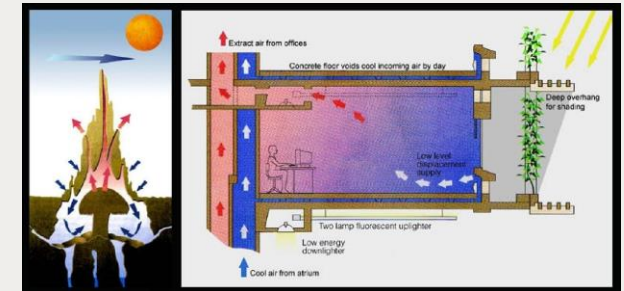
How to become primary producers without using rare materials ? Organic solar panels, Sugar battery, Heavy-metal-free battery, Decentralization [Zhu, 2014] [Ding, 2016], [Brozzolotto, 2016],[Ahmed, 2022]



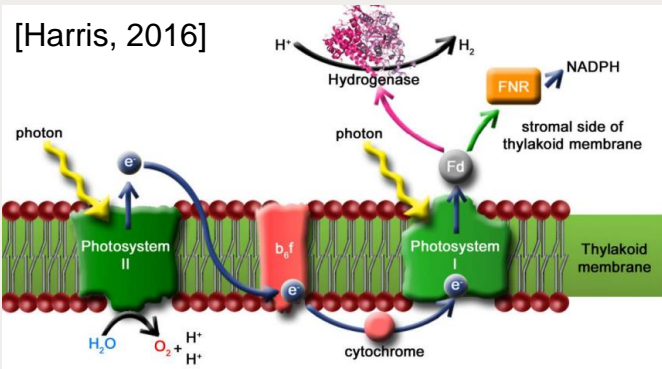
How to combine both energy and matter sustainability ? Use artificial photosynthesis to stock energy in matter, produce solar fuel and molecular building blocks [Haas, 2018], [Atkinson, 2020],[Yang, 2022], [Wang, 2022]



How to reduce each system's energy consumption ? Thermic energy management, anti-biofouling, object circadian cycle, data storage, mutualization. [Karaca, 2013], [Sullivan, 2020], [Liu, 2021], [Tian, 2022]

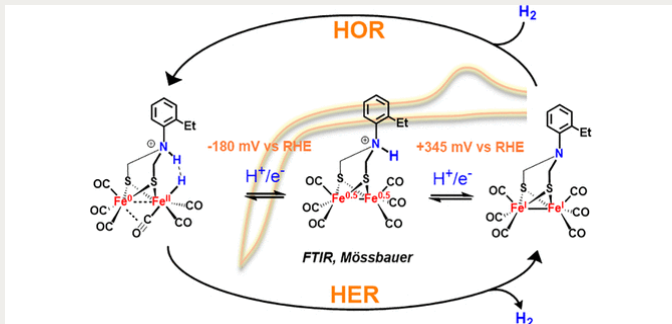


Example of current R&D projects at various levels

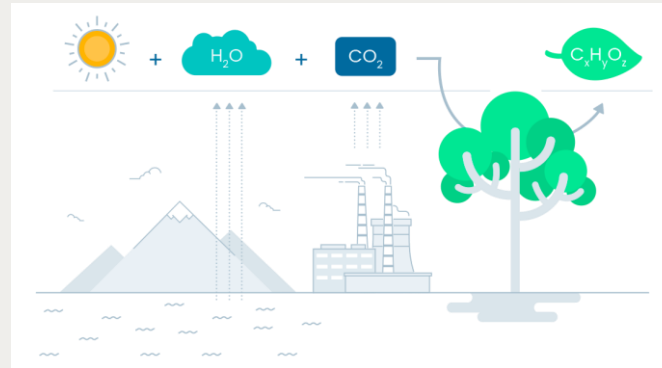


Designing new material

Iron-based catalysts inspired from the active site of biological [Fe₂Fe] Hydrogenase behave as bidirectional electrocatalysts for interconverting H₂ and protons efficiently under near-neutral aqueous conditions [Ahmed, 2022]

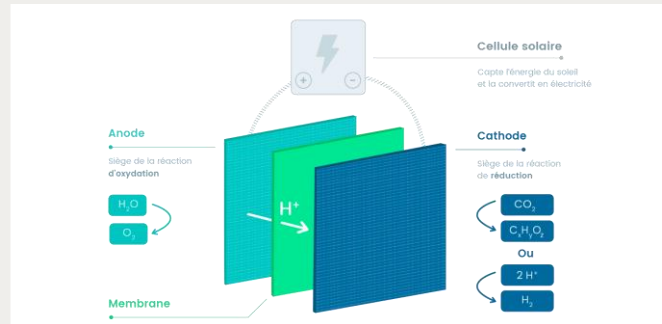


Group Discussion Meeting

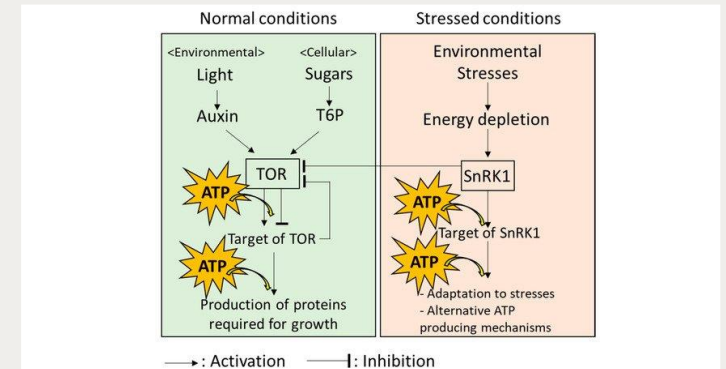


Designing new systems

Artificial photosynthesis to collect and store solar energy through, H₂O oxidation and the formation of H₂ or the reduction of CO₂ into solar fuel or other molecules of interest. E-scaled project [2018-2022]

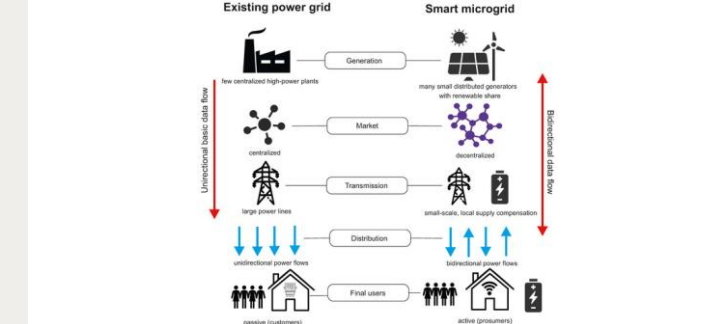


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Designing new network

Similarities between energy-related processes in plant cells and electrical power grids are identified and used to inspire the definition of new models of flexible and resilient electrical power grids, particularly microgrids. [Suzuki, 2022]



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